

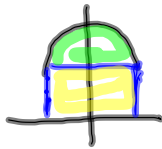
$$37 \quad \int_{-2}^3 \frac{x}{|x|} dx = 1$$



$$\frac{x}{|x|} = \begin{cases} 1 & \text{if } x > 0 \\ \text{disc at } x=0 & \text{if } x = 0 \\ -1 & \text{if } x < 0 \end{cases}$$

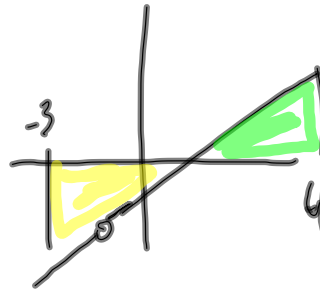
disc at $x=0$

20



$$39 \quad \frac{x^2 - 1}{x + 1} = \frac{(x+1)(x-1)}{x+1}$$

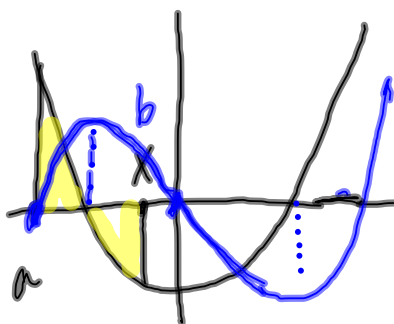
$$\int_{-3}^4 \frac{x^2 - 1}{x + 1} dx$$



Nov 17-12:43 PM

5.3 Fundamental Theorem of Calculus

F T C



$$y = f(x)$$

$$A(x) = \int_a^x f(x) dx$$

How are $A(x)$ & $f(x)$ related?

$$A'(x) = f(x)$$

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$$\int_0^b x^2 dx = \left. \frac{x^3}{3} \right|_0^b = \frac{b^3}{3} - \frac{0^3}{3} = \frac{b^3}{3}$$



Nov 17-1:33 PM

$$\begin{aligned} \int_0^1 \frac{1}{1+x^2} dx &= \tan^{-1} x \Big|_0^1 \\ &= \tan^{-1} 1 - \tan^{-1} 0 \\ &= \frac{\pi}{4} - 0 = \boxed{\frac{\pi}{4}} \approx . \end{aligned}$$

Nov 17-2:00 PM

$$\int_0^b 3x^2 dx = b^3$$

$$\int_0^b x^3 dx = \frac{b^4}{4}$$

$$\int_0^b 5x^4 dx = b^5$$

$$\int_0^b x^7 dx = \frac{b^8}{8}$$

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$$\int_a^b x^2 dx = \frac{b^3}{3} - \frac{a^3}{3} \leftarrow \begin{array}{l} \text{antideriv} \\ \text{at } a \end{array}$$

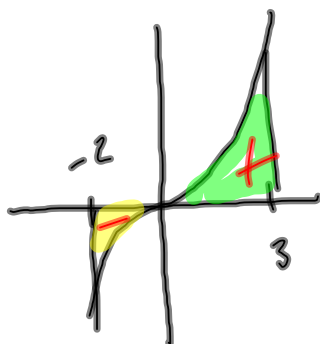
↑
antiderivative
at b

general
antiderivative

$$f(x^2) = \frac{x^3}{3}$$

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$$\int_{-2}^3 x^3 dx = \left. \frac{x^4}{4} \right|_{-2}^3 = \frac{3^4}{4} - \frac{(-2)^4}{4}$$



$$= \frac{81}{4} - \frac{16}{4} = \frac{65}{4} = 16\frac{1}{4}$$

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$$\int_a^b f(x) dx = F(b) - F(a)$$

where $F(x)$ the antiderivative of $f(x)$
 $F'(x) = f(x)$

F.T.C. $F(x) = \int f(x) dx$

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$$\begin{aligned}\int_0^{\pi} \sin x \, dx &= -\cos x \Big|_0^{\pi} \\ &= -\cos \pi - (-\cos 0) \\ &= -(-1) + 1\end{aligned}$$



$$= 2$$

Nov 17-1:51 PM